CASSINI RADAR INVESTIGATION OF TITAN

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Saturn has been called one of the most intriguing planetary realms in the solar system. Its largest moon, Titan, boasts organic chemistry that may hold clues to how life formed on the primitive Earth. The Cassini Mission, to be launched in October 1997, will explore Saturn and its moons under joint sponsorship of NASA, the European Space Agency and the Italian Space Agency. It will first execute two gravity-assist flybys of Venus, then pass close to Earth and Jupiter. These gravity assists allow the spacecraft to arrive at Saturn in July 2004. Cassini will begin the first of some five dozen orbits during its four-year mission . In November 2004, the European-built Huygens probe will be released from the spacecraft for its descent through Titan's atmosphere and perhaps a brief observation per iod following surface impact. During the course of 'the orbiter's mission, it 'will perform some three dozen close flybys of particular bodies of interest -- including more than 30 encounters of Titan.

Titan's surface temperature appears to be about -178 C. Methane appears below its saturation pressure near the surface, raising the possibility of lake of ethane with dissolved methane. Methane is photolyzed into ethane, acetylene, ethylene, and hydrogen cyanide, the latter a building block of amino acids. Titan's 200 km-deep atmospheric has surface of about 1.6 bars, predominantly consisting of nitrogen with other hydrocarbons. Its surface s non-uniform at radar wavelengths and has a large surface feature that is bright in infrared. Seasonal changes in disk images have been noted.

Regional-scale characterization of Titan's surface is one of Cassini's principal objectives. Although the Huygens probe may be able to characterize its local environment, mapping the surface can be accomplished with a radar instrument that acts as a Ku band (14 GHz) synthetic aperature radar (SAR), microwave radiometer, altimeter and scatterometer. Current plans allow near-global coverage at surface resolutions of 100 - 300 km using the radiometer in a scaning mode and approximately 30% areal coverage using SAR at resolutions varying from a km to several hundred meters. SAR observations will be taken at incidence angles from 15 to 40 degrees. A few percent of the surface can be topographically mapped, and very high sensitivity scatterometry can be used to study areas of extremely low backscatter.

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